

ANTS OF THE GENUS *CARDIOCONDYLA* EMERY IN THE UNITED STATES

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This article attempts to present all facts known to the author concerning the taxonomy, biology, and distribution of the four species of *Cardiocondyla* that have been recorded from the United States. Although these species have been found only in Florida, it is reasonable to expect that representatives of the genus will be collected eventually in some of the other subtropical areas in the country, since its members are known to occur over most of the warmer regions of the earth. Often it is extremely difficult to ascertain whether the species in a given region are native or introduced. Certainly the small size of the ants and their colonies, as well as their habit of nesting within plants or other exportable material, would afford them an excellent means of becoming widely disseminated by commerce. Emery (1909, Deut. Ent. Ztschr. p. 27) states that although *emeryi* Forel was described from specimens taken in St. Thomas, Virgin Islands, he believes it was probably introduced there from an original home in Asia. Wheeler (1932, N. Y. Ent. Soc. Jour. 40: 7) also remarks that two of the species occurring in Florida (*nuda* var. *minutior* Forel and *wroughtoni* var. *bimaculata* Wheeler) were probably introduced. He did not venture an opinion on the remaining species.

Although the biology of our species is little known, *emeryi*, at least, has been observed to nest in the soil and within cavities of plants and, like the variety *bimaculata*, has been found visiting honeydew-excreting insects and feeding on the flesh of small arthropods.

One of the most interesting facts about these ants is the occurrence of ergatoid, or wingless, workerlike males in some of our species and the strong probability that they are produced by all of them. Only the ergatoid male is known for the species *wroughtoni*, and this is so peculiar in appearance that when Forel (1890, Ann. Soc. Ent. de Belg. 34: 110) described it he proposed the new generic name *Emeryia* for it. Recently the author has seen an ergatoid male among some specimens of *wroughtoni* var. *hawaiiensis* Forel from Hawaii; hence, it may be expected that this type of male likewise occurs in the variety *bimaculata*. For many years *emeryi* was known to possess only a normal male, but recently Borgmeier (1937, Rev. de Ent. 7: 132) has shown that this species also has an ergatoid male. So perplexing have been the females, males, and ergatoid males of *Cardiocondyla* that so illustrious a formicologist as Emery

(1909, *ibidem*) erroneously described an apterous, ergatoid individual as the female of *emeryi*, the specimen having been received with some *emeryi* workers from St. Thomas, Virgin Islands. Later (1917, Soc. Ent. de France Bull. p. 96), realizing his error, he erected the genus *Xenometra* for this female, which he assumed to be parasitic. Such instances clearly indicate the need for more diligent study in the genus.

This article has been based largely on specimens in the United States National Museum, the Museum of Comparative Zoology, and the personal collection of Dr. Wm. M. Mann. In addition, various friends have contributed specimens and notes. Unless otherwise stated the generic and specific descriptions as well as the keys are those of the author and apply only to the species in the United States. Only selected references are given. Figures of the worker cast of each species are included as an aid to recognition.

Cardiocondyla Emery

Cardiocondyla Emery, 1869, Accad. degli Aspiranti, Naples Ann. 2: 21.

Emeryia Forel, 1890, Soc. Ent. de Belg. Ann. 34: 110.

Leptothorax Mayr (part), 1866, Sitz. ber. Akad. Wiss. Wien 53: 508.

Monomorium Santschi (part), 1912, Soc. Ent. de Belg. Ann. 56: 163.

Genotype, *Cardiocondyla elegans* Emery (monobasic).

Worker.—Monomorphic. Length 1.6–2.5 mm. Head subrectangular, longer than broad, with straight or faintly emarginate posterior border, rounded posterior corners, and feebly convex, almost subparallel sides. Antenna 12-segmented; funiculus with a 3-segmented club, the last segment of which is often several times as long as the preceding segment; funicular segments 3 through 5 as broad as or broader than long. Eye prominent, placed less than its greatest diameter from base of mandible. Frontal carinae short, scarcely divergent posteriorly. Frontal area small, indistinct, or lacking. Clypeus projecting above mandibles, middle of anterior border subtruncate. Prothorax usually with pronounced humeri. Promesonotal suture obsolescent or absent. Mesoe-pinotal constriction sometimes absent but more often weakly to rather strongly developed. Epinotum usually with a pair of short or moderately long, rather blunt spines (spines sometimes even tuberculate). Petiole distinctly pedunculate. Post-petiole very noticeably broader than petiole, much broader than long, with rounded sides and rather subparallel anterior and posterior borders. First segment comprising most of gaster. Body reticulate-punctate, the head often subopaque. Body with closely appressed, grayish pubescence. Erect hairs almost absent except for a few on mandibles, clypeus, and posterior part of gaster. Habitus of a *Leptothorax*.

Female.—Length 2.25–3 mm. Larger than worker. Ocelli present but small. Thorax of the usual female structure. Mesonotum projecting prominently into the pronotum. Anterior wing with small stigma and an incomplete or poorly defined cubital cell. Radial and discoidal cells lacking. Body usually more coarsely sculptured than that of worker; otherwise, except for the normal female structures, very similar to worker.

Ergatoid male (a).—Length 1.7 mm. Antenna 11-segmented (12-segmented in the worker) one of the segments being lost through a more or less imperfect fusion of 2 segments. Mandible very long and narrow, without masticatory border, rather strongly curved in the apical half and tapering into an acute point. No ocelli. Anterior border of clypeus with a very strong emargination, on each side of which there is a pronounced angle or tooth. Eye somewhat similar to that of worker. Thorax wingless, with a slight resemblance to that of worker. Pronotum with very strong humeral angles. Mesonotum with a prominent, transverse gibbosity which is extended on each side as a distinct protuberance. Epinotum with a pair of short spines or tubercles. Postpetiole of a shape somewhat similar to that of the worker but more subrectangular.

Occurs occasionally in *emeryi* and will very probably be found in *wroughtoni* var. *bimaculata*.

Ergatoid male (b).—Apterous and workerlike. Mandible with 4 or 5 teeth. No ocelli. Antenna 12-segmented, shorter and thicker than in worker. Eye not so large as in normal male. Pronotum with more pronounced humeri than in worker. (Adapted from Forel, 1904, Rev. Suisse Zool. 21: 7.)

An ergatoid male answering to this general description will very probably be found in *nuda* var. *minutior*, and there is also reasonable likelihood that it may be found in *venustula* since both these forms are closely related to *nuda*, a species which has an ergatoid male of this type.

Male.—2 mm. Antenna 13-segmented. Ocelli small. Eye prominent, placed close to base of mandible. Mandible of same general shape as in worker. Thorax of the usual male conformation but lacking Mayrian furrows. Anterior wing with a small stigma, and an incomplete or poorly defined cubital cell. Radial and discoidal cells lacking. Petiole and postpetiole with a striking similarity to that of worker. Genital appendages small.

KEY TO SPECIES

(For identification of workers)

1. Petiolar node, from above, very distinctly longer than broad, compressed. (Prothorax with well defined humeral angles. Promesonotum compressed. Epinotal spines short, stout, approximately half as long as their interapical space. Last segment of antennal club more than 3 times the length of the preceding segment. Color usually yellowish red to dark reddish with brown or black gaster, light appendages, and the antennal club distinctly infuscated.) (Plate 5, fig. 1).....*emeryi* Forel
- Petiolar node, from above, not as described, more subglobular and lacking the distinctly compressed appearance..... 2
2. Epinotum with a pair of extremely small, scarcely perceptible tubercles instead of spines. Body length 2–2.25 mm. (Last segment of antennal club approximately twice the length of the preceding seg-

- ment. Mesoepinotal constriction distinct. Prothorax with rounded humeral angles.) (Plate 5, fig. 4).....*venustula* Wheeler
 Epinotum with a pair of very short to moderately long spines. Smaller species..... 3
3. Gaster pale brown to brown with a spotlike infuscation on each side, which is sometimes rather indistinct. Mesoepinotal constriction pronounced (best seen in profile). Epinotal spines moderately long and prominent, longer than one-half their interapical space. (Plate 5, fig. 2).....*wroughtoni* var. *bimaculata* Wheeler
 Gaster of a deep uniform brown or black. Mesoepinotal constriction either absent or weakly developed. Epinotal spines very short, scarcely one-half the length of their interapical space. (Plate 5, fig. 3).....*nuda* var. *minutior* Forel

Cardiocondyla emeryi Forel

(Plate 5, fig. 1, worker)

Cardiocondyla emeryi Forel, 1881, Mitt. Muench. Ent. Ver. 5: 5, *worker*; Andre, 1881, Soc. Ent. de France Ann. 1: 69, pl. 3, *worker, male*; 1882, Spec. Hymen. Europe 2: 328, pl. 21, figs. 9-12, 14, *worker, male*; Wheeler, 1905, Am. Mus. Nat. Hist. Bull. 21: 89; ibidem, 24: 128, pl. 11, fig. 6; Emery, 1909, Deut. Ent. Ztschr. p. 20, 26, fig. 7, *a, b, e*; Arnold, 1916, So. Afr. Mus. Ann. 14: 200, pl. 5, f. 57, *worker, female, male*; Emery, 1922, Gen. Insect. Fasc. 124, pp. 124-125, pl. 2, fig. 20; Smith, 1930, Fla. Ent. 14: 4; Wheeler, 1932, N. Y. Ent. Soc. Jour. 40: 7; Smith, 1936, Puerto Rico Univ. Jour. Agr. 20: 835, fig. 1; Borgmeier, 1937, Rev. de Ent. 7: 129-134, *ergatoid male*, p. 133, figs. 1-5.

Worker.—Length 1.6-2.1 mm. Head subrectangular, approximately one and one-third times as long as broad, with almost straight posterior border, rounded posterior corners, and feebly convex, subparallel sides. Scape lacking twice its greatest width of reaching posterior border of head. Last segment of antennal club more than 3 times the length of the preceding segment. Eye prominent, but not strongly convex, placed less than its greatest diameter from base of mandible. Frontal carinae short, scarcely divergent posteriorly. Frontal area small, not well defined. Clypeus produced, prominently projecting above mandibles (best seen in profile); from above, the median area of the anterior border appearing subtruncate, with the lateral section beneath each antennal socket laminate and not concealing the antennal insertion. Mandible with approximately 4 to 6 teeth. Thorax, from above, without promesonotal suture but with very distinct humeral angles and mesoepinotal constriction; promesonotum compressed. Epinotal spines short, rather stout, approximately half as long as their interapical space. Petiolar node, from above, convex, distinctly longer than wide, somewhat compressed. Postpetiole convex above, about one-third broader than long, with almost straight anterior and posterior margins, and convex sides. Legs moderately long and slender; middle and hind tibiae without spurs.

Head and thorax above rather finely reticulate-punctate, gaster smooth.

Body and appendages with fine, grayish, very closely appressed pubescence.

Hairs almost absent from body except on clypeus, mandibles, and posterior end of gaster.

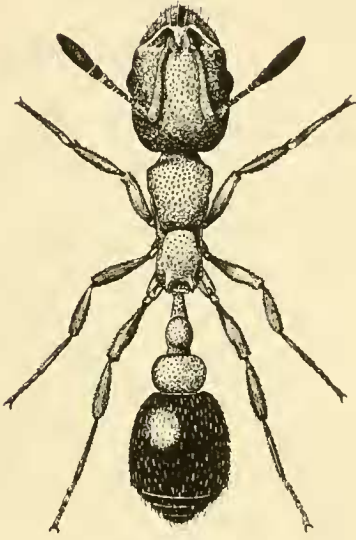
Head, thorax, petiole, and postpetiole varying from light to dark yellowish red, gaster uniform dark brown or black, appendages light, with the antennal club very distinctly infuscated.

Description based largely on specimens from Mayaguëz, Puerto Rico, collected by the author.

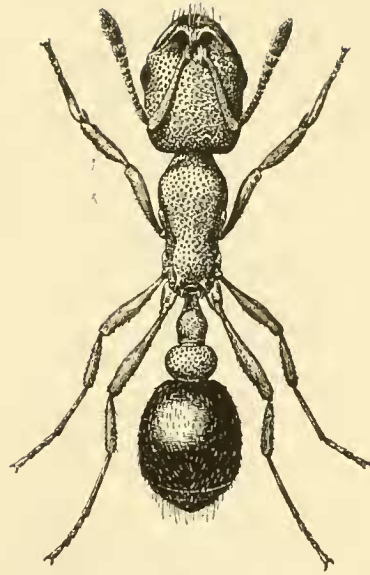
Female.—Length 2.5 mm. Head, thorax and petiole brown, abdomen black, legs, antennae and mandibles yellow, the club of the flagellum infuscated. Head very similar to that of worker, but a trifle wider. Eyes rather small, very little larger than in the worker. Ocelli small, inconspicuous and sunk a little below the surface. Pronotum widely exposed at the anterior lateral angles, which are rounded; the median portion of the pronotum is occluded by the mesonotum, which extends far forward in the middle. The mesonotum is convex in front, very feebly convex or nearly flat transversely in its posterior half. The scutellum is rather flat, very slightly raised above the level of the metanotum. Dorsum of the epinotum wider than long, widest at the base, sloping downwards posteriorly; the epinotal teeth are longer than in the worker. Abdomen similar to that of the worker but larger. Wings hyaline, the nervures hardly distinguishable. Puncturation as in the worker. The pubescence of the abdomen longer and more abundant than in the worker." (Arnold, 1916, So. Afr. Mus. Ann. 14: 201-202.)

The following description by Borgmeier (1937, Rev. de Ent. 7: 132) is based upon one specimen found with 6 workers in a small acacia gall at Rio de Janeiro, Brazil, on July 15, 1935:

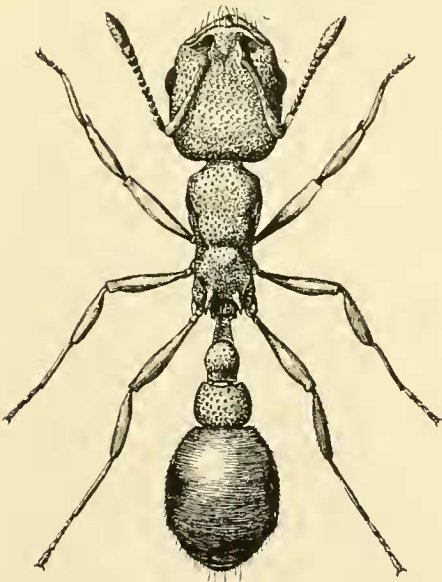
Ergatoid male.—Length 1.7 mm. Head without mandibles slightly longer than wide (55 : 50), narrower anteriorly, posterior angles broadly rounded, posterior border straight. Eyes relatively small, slightly convex, situated in the anterior third of the sides of the head. Mandible very long, linear, without apical border, tapering toward the apex and pointed, straight in the basal half, curved in the apical half. Clypeus emarginate in front, with 2 carinae which enclose a deep and wide furrow; this furrow prolonged into the frontal area up to the middle of the front. Frontal carinae short, divergent posteriorly. Antenna 11-segmented, the 5th funicular segment with a small incision on both antennae. The first funicular segment elongate, claviform, as long as the combined length of the 3 succeeding segments; terminal segment clavate, slightly longer than the combined length of the 6 preceding segments. Scape more or less exceeding three-fourths the length of the head. Pronotum with sharp humeral angles. Promesonotal suture faintly indicated, strongly convex anteriorly. Mesonotum slightly longer than wide (4 : 3), with a transverse gibbosity which forms on each side a triangular protuberance. Meso-epinotal suture represented by a deep furrow. Base of epinotum longer than wide, and also longer than the declivity; slightly convex anteriorly, posteriorly with 2 obtuse teeth. Pedicel as in worker. Petiole pedunculate, node small, elongate



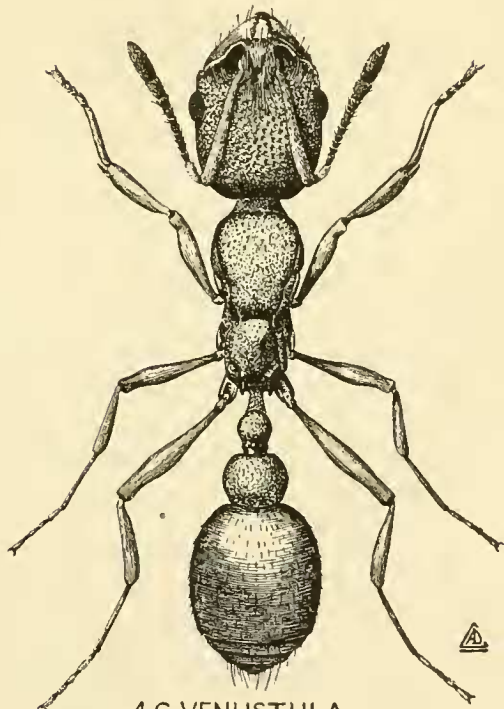
1. *C. EMERYI*



3. *C. NUDA* var. *MINUTIOR*



2. *C. WROUGHTONI*
var. *BIMACULATA*



4. *C. VENUSTULA*

Workers of the United States Species of *Cardiocondyla* Emery.

Fig. 1, *emeryi* Forel; Fig. 2, *wroughtoni* var. *bimaculata* Wheeler;
Fig. 3, *nuda* var. *minutior* Forel; Fig. 4, *venustula* Wheeler.

(Illustrations by Arthur D. Cushman)

oval, in profile slightly convex. Postpetiole much wider than petiole, with straight anterior border (in *wroughtoni* the anterior border is concave), the lateral borders slightly convex. Gaster oval, truncate in front.

"Mandibles and head glossy, with sparse, finely pointed hairs. Thorax moderately dull, punctate-reticulate. Pedicel and gaster shiny, with fine, sparse punctures. Head, mandibles, pedicel, gaster and legs with a yellowish pubescence, prostrate and relatively long. Thorax naked. No erect pilosity. Color pale, testaceous-yellow. Gaster fuscous-yellow."

Male.—Length 2 mm. Head approximately one and two-tenths times as long as broad, with rounded posterior border, and sides strongly convergent above eyes. Ocelli small, situated on a very slight protuberance. Eye prominent, rather strongly convex, placed close to base of mandible. Antenna 13-segmented, all segments longer than wide; scape approximately as long as the combined lengths of the first 5 or 6 funicular segments. Clypeus not projecting above base of mandibles so prominently as with worker, and also with less well developed lateral laminae. Mandible with 4 or 5 teeth, the 2 apical teeth rather prominent. Prothoracic humeri distinct. Parapsidal sutures but no Mayrian furrows. Middle of anterior border of mesoscutum somewhat angularly projecting into the prothorax. Pronotum, from above, not concealed by mesoscutum. Epinotal spines about as in worker. Legs moderately long and slender. Anterior wing pale, with small but distinct stigma, and a single cubital cell. No discoidal or radial cells. Petiole, postpetiole, and gaster similar to those of worker. Genital appendages small, usually not exposed. Sculpture, pilosity, and pubescence like those of worker. Color differing from that of worker mainly in that the head is somewhat darker, and that the funiculus, with the exception of the first segment is infuscated.

The above description is drawn from a specimen from Havana, Cuba, collected by "Baker" and deposited in the collection of the Museum of Comparative Zoology. Arnold (1916, *ibidem*, p. 202) states, "scape about as long as the first 8 joints of the flagellum." This is not true for the Cuban specimen or for a specimen from Makapun, Hawaii, collected by O. H. Swezey. In these ants the scape is approximately as long as the combined length of the first 5 or 6 funicular segments.

The worker of *emeryi* can be readily recognized by its very characteristic petiole, the short, stout epinotal spines, compressed promesonotum, prominent humeral angles, distinct but not strongly pronounced mesoepinotal constriction, and color. Both color and sculpture are variable, however.

This seems to be one of the best known and most widely distributed species of the genus. The ant no doubt owes a great deal of its distribution to commerce. Wheeler (1908, *Amer. Mus. Nat. Hist. Bull.* 24: 128), writing of the presence of *emeryi* in Puerto Rico, remarked, "the colonies of this ant are small and occur in sandy places, especially in river or creek bottoms and on sea beaches." The author has found that although such situations are commonly inhabited by *emeryi* in Puerto

Rico, nests are also constructed in clay soil. The nest entrances are very small and therefore are easily overlooked. Borgmeier (1937, *ibidem*, p. 131) has also found colonies nesting in cane culms, and in *Solanum*. He thinks that the species is indigenous to Brazil. As previously mentioned, *emeryi* has both a normal and an ergatoid male of the (*a*) type, the former being much more common.

Type locality.—St. Thomas, Virgin Islands.

Other localities.—Florida: Coral Gables (R. E. Gregg) in weedy field, Miami (collection of American Museum of Natural History), and dry marsh on Tamiami Trail, 10 miles south of Miami (R. E. Gregg); Bahamas; western Mexico; West Indies; Island of Madeira; Belgian Congo; South Africa; Madagascar; Palestine; Syria; East Indies; Formosa; Guam; Polynesia; Tahiti; Territory of Hawaii.

***Cardiocondyla venustula* Wheeler**

(Plate 5, fig. 5, worker)

Cardiocondyla venustula Wheeler, 1908, Amer. Mus. Nat. Hist. Bull. 24: 128-130, pl. 11, fig. 5, *worker, female*; Wheeler and Mann, 1914, Amer. Mus. Nat. Hist. Bull. 23: 19, *female*; Smith, 1936, Puerto Rico Univ. Jour. Agr. 20: 836, fig. 2, *worker*; Wolcott, 1936, *ibidem* 20: 543, fig. 5; Wheeler, 1936, Harvard Univ. Mus. Compar. Zool. Bull. 80: 199, *worker*.

Cardiocondyla nuda var. *minutior* Smith, not Forel, 1933, Fla. Ent. 17: 25.

Worker.—Length 2-2.25 mm. Head subrectangular, approximately one and one-fourth times as long as broad, with rounded posterior corners, very weakly emarginate posterior border, and weakly convex, subparallel sides. Antennal scape lacking a space almost equivalent to its greatest width of reaching the posterior border of the head; last segment of club approximately twice the length of the preceding segment, funicular segments 3, 4, and 5 broader than long. Eye prominent, moderately convex, placed slightly less than its greatest diameter from base of mandible. Frontal carinae short, scarcely divergent behind. Frontal area small, triangular. Clypeus about as described for *emeryi*. Mandible with 5 or 6 teeth, the 2 apical teeth rather prominent. Thorax, from above, larger, stouter, and more convex than that of *emeryi*. Prothorax with rounded humeri. Mesoepinotal constriction rather prominent, best seen in profile. Epinotum with a pair of very small, scarcely perceptible tubercles, base of epinotum at least one and one-half times as long as the declivity. Petiolar node, from above, subglobular, about twice as wide as long, tapering off rather rapidly into the peduncle. Postpetiole transversely elliptical, about one and one-fourth times as broad as long. Legs moderately long and slender.

Mandibles rather smooth and shining although bearing a few scattered punctures. Clypeus longitudinally rugulose. Head reticulate-punctate. Meso- and metapleura densely punctured, thorax above more finely sculptured. Head subopaque; thorax, petiole, and postpetiole somewhat more glabrous.

Pubescence fine, closely appressed, grayish in some lights. Hair as in *emeryi*.

Head and gaster usually a deep brown, approaching black; thorax, petiole,

and postpetiole somewhat lighter. Legs and scape usually even lighter, antennal funiculi infuscated.

Redescribed by author from cotype specimens.

Female.—Length 2.75–3 mm. Resembling the worker. Thorax narrower than the head, more than twice as long as broad, somewhat flattened above. Epinotal teeth stronger than those of the worker but of the same shape. Petiole and postpetiole of the same shape and proportions.

“Head, thorax and postpetiole opaque above; petiole slightly more shining; all of these parts uniformly reticulate-rugose; the mesonotum behind with more longitudinal rugae; epinotal declivity smooth and shining.

“Pubescence as in the worker. Wings minutely hairy, with long marginal fringe on the posterior pair.

“Head, thorax, and nodes of petiole uniformly dark brown; gaster black, except the bases of segments 2–4, which are yellowish. Mandibles, legs and antennae of the same color as in the worker. Wings white with colorless veins and stigma.” (Wheeler, 1908, Amer. Mus. Nat. Hist. Bull. 24: 129).

Male.—Unknown. Will very probably be an ergatoid male of the (*b*) type.

The worker of *venustula* can be distinguished by its large size, subglobular petiolar node, small tubercles on the epinotum, rounded humeri, prominent longitudinal rugulae of the clypeus, and color.

Wheeler (1908, *ibidem*, p. 130) states, “*C. venustula* is not uncommon in sandy and gravelly places, especially on the sea beaches where it lives in small colonies, comprising a single dealated queen and a few dozen workers, in shallow nests like those of some species of *Leptothorax*.” Wheeler collected winged females at Coama Springs, Puerto Rico, on March 23 while they were issuing from a nest in a gravelly creek bottom. H. L. Dozier collected workers on several occasions from dry cow dung in very arid pastures at Ponce, Puerto Rico.

Type localities.—Culebra Island; Coama Springs, Puerto Rico.

Other localities.—Florida: Hollywood (D. E. Read); Haiti: Jacmel (W. M. Mann); Mona Island (Lutz); Puerto Rico: Ponce and Guyama (H. L. Dozier), Mayaguëz (M. R. Smith).

***Cardiocondyla nuda* var. *minutior* Forel**

(Plate 5, fig. 3, worker)

Cardiocondyla nuda var. *minutior* Forel, 1899, Fauna Hawaiiensis 1: 120, *worker*; Wheeler, 1932, N. Y. Ent. Soc. Jour. 40: 7; Phillips, 1934, Hawaii Univ. Expt. Sta. Pineapple Prod. Coop. Assn. Ltd. Bull. 15: 21–22.

Worker.—Length 1.5–1.7 mm. Head subrectangular, approximately one and one-fourth times as long as broad, with apparently straight posterior border, rounded posterior corners, and feebly convex, subparallel sides. Antennal scape lacking approximately twice its greatest width of reaching posterior

border of head; funicular segments 3 through 7 broader than long, last funicular segment approximately 3 times length of preceding segment. Eye prominent, moderately convex, placed approximately one-half its greatest diameter from base of mandible. Frontal carinae short, subparallel, scarcely divergent posteriorly. Frontal area triangular, very small, but distinct. Clypeus somewhat similar to that of *venustula*. Mandible with 2 prominent apical and 3 or 4 smaller basal teeth. Prothorax with distinct subangular humeri. Promesonotal suture missing. Mesoepinotal impression absent or very weakly developed. Epinotal spines short, scarcely longer than one-half their interapical space. Petiole, from above, subglobular. Postpetiole approximately one and one-third times as broad as long, with almost straight anterior and posterior borders and very convex sides. Base of gaster meeting sides in very slightly perceptible angles; first segment occupying most of gaster.

Mandible more or less shining in spite of the scattered, piligerous punctures. Clypeus longitudinally rugulose. Head, thorax, petiole, and postpetiole reticulate-punctate. Punctures on side of thorax dense. Gaster smooth and shining.

Pubescence fine, grayish, closely appressed, in some lights appearing rather dense on head and gaster. A few erect hairs on mandibles, clypeus, and posterior section of gaster.

Head usually dark brown but apparently never so dark as the gaster, which varies from a very dark brown to black. Thorax, petiole, postpetiole, legs, and antennae lighter. Antennal funiculus usually infuscated, especially in the region of the club.

Description based largely on workers from Pensacola, Fla., collected by R. M. Lhamon and F. F. Bibby.

Female.—Length 2.25–2.5 mm. Similar to worker except for its larger size, more angular humeri, slightly broader postpetiole (one and one-half times its length), much darker and more nearly uniform color of body, more apparent pubescence, and more coarsely sculptured body, especially the thorax. There are also unusually small ocelli on the head.

Description drawn from two females collected at Kunia, Island of Oahu, Territory of Hawaii, by Kiyoshi Ito.

Male.—Unknown. Will very probably be of the ergatoid (*b*) type.

The worker of this small species can be distinguished by its more or less subglobular petiolar node, absent or very weakly developed mesoepinotal impression, short epinotal spines, subangular humeri, and color, in which the head is usually dark brown, the gaster even darker, and the appendages and remainder of the body lighter than either.

Phillips (1934, *ibidem*) says that the colonies of this species are very small; one found in grassland contained only 20 or 30 individuals. He states that Williams has observed nests in compost heaps. At Pensacola, Fla., workers were collected from holly but no statement was made as to their nesting site.

Type localities.—Honolulu and Molokai, Territory of Hawaii.

Other localities.—Florida: Weedy field, Coral Gables (R. E. Gregg), road in mangrove swamp, Coconut Grove (R. E. Gregg), dry marsh on Tamiami Trail, 10 miles from Miami (R. E. Gregg), roadside, Palma Vista Hammock, Homestead (R. E. Gregg), Miami (A. E. Wight), Perrine and Sebring (D. E. Read), Pensacola (R. M. Lhamon and F. F. Bibby); Midway Island; Necker Island; French Frigate Shoal; Easter Island; New Britain Island; Flint Island.

***Cardiocondyla wroughtoni* var. *bimaculata* Wheeler**

(Plate 5, fig. 2, worker)

Cardiocondyla wroughtoni var. *bimaculata* Wheeler, 1929, Bol. Lab. Zool. Gen. e Agr. R. Scuola Super. Agr. Portici 24: 43–44, *worker, female*; Wheeler, 1932, N. Y. Ent. Soc. Jour. 40: 7; Smith, 1933, Fla. Ent. 17: 24.

Worker.—Length 1.75–2 mm. Head subrectangular, approximately one and one-fourth times as long as broad, with rounded posterior corners, straight posterior border, and feebly convex sides. Scape lacking slightly more than its greatest width of reaching posterior border of head. Last segment of antennal club approximately 3 times the length of the preceding segment; funicular segments 3 through 7 as broad as or broader than long. Eye prominent, moderately convex, situated slightly less than its greatest diameter from base of mandible. Frontal carinae short, slightly divergent posteriorly. Clypeus produced above mandibles (best seen in profile); median area of anterior border with a weak emargination or impression, lateral sections laminate, not concealing antennal insertions. Frontal area small, not clearly defined. Mandible with about 5 teeth, the 2 apical teeth rather prominent. Prothoracic humeri well defined, subangular. Promesonotal suture absent. A slight constriction often visible on each side of thorax in promesothoracic region. Mesoepinotal constriction pronounced (best seen in profile). Epinotal spines stout, moderately long, longer than one-half their interapical space. Petiole, from above, subglobular, about one-sixth to one-eighth broader than long, not so long in proportion to breadth or laterally compressed as with *emeryi*. Postpetiole about one-fourth broader than long, with distinctly concave anterior border, more nearly straight posterior border, and convex sides. Legs moderately long and slender. First gastric segment occupying most of gaster.

Head, thorax, petiole, and postpetiole reticulate-punctate, at least the first two subopaque. Gaster smooth and shining.

Pubescence grayish, fine, short, closely appressed on body and appendages.

Body almost devoid of hair except on anterior border of clypeus, mandibles, venter, and posterior section of gaster.

Color of body varying from a pale brown or yellowish brown to a moderate light brown; appendages usually lighter, with antennal funiculi infuscated and darker than scapes. First segment of gaster with a distinct infuscated spot on each side and sometimes a variable amount of lighter infuscation between them.

Description based on specimens from Bradenton (G. D. Reynolds) and Paradise Key (W. M. Wheeler), Fla.

Female.—Length 2.5 mm. Larger and stouter than worker but similar except for the following: Very small ocelli. Thorax of the usual female type but rather subrectangular. Mesonotum prominently projecting into pronotum. Anterior wing pale, with small stigma and an incomplete or poorly defined cubital cell. Most of first gastric segment so deeply infuscated that the lateral spots are either poorly defined or are absent.

Described from specimens taken at Bradenton, Fla. (G. D. Reynolds).

Male.—Undescribed. Will very probably prove to be an ergatoid of the (a) type, such as is known for *wroughtoni* Forel, and also for its variety *hawaiiensis* Forel.

The worker of *bimaculata* can be readily distinguished by its color, spots on the gaster, pronounced mesoepinotal constriction, somewhat subglobular petiolar node, moderately long and rather stout epinotal spines, and the last segment of the antennal club, which is approximately 3 times the length of the preceding segment.

The author has not been able to examine cotypes of the variety *hawaiiensis* or of *bimaculata*, but if the specimens from the Wheeler collection of the Museum of Comparative Zoology are typical of both varieties, it would seem that the variety *bimaculata* is scarcely distinct from *hawaiiensis* and that eventually the name *bimaculata* may have to be relegated to synonymy.

Wheeler (1932, *ibidem*) remarked that two colonies of *bimaculata* were collected from the hollow culms of sedges at Royal Palm Park, Fla. He also stated that this ant, which was probably introduced from the Orient in living plants, "closely resembles the var. *hawaiiensis* Forel, except that the two spots on the sides of the first gastric segment of the worker are large and dark brown. Sometimes there is a third smaller and paler brown spot in the middorsal line." G. D. Reynolds who collected specimens at Bradenton, Fla., had the following to say concerning it, in a letter: "I found *C. wroughtoni* var. *bimaculata* nesting in flowerpots at the base of plants, and at the base of concrete footings; I also have seen them present under decaying fruits of peppers and tomatoes. Whether these ants were nesting or feeding there I cannot be sure. This species attends aphids, root and aerial forms. * * * The ants were found feeding on dead or dying insects. They were attracted to sugar-honey syrup (1-1-3)."

Type locality.—Karashisho, Formosa (F. Silvestri).

Other localities.—Florida: Royal Palm Park and Paradise Key (W. M. Wheeler), Winter Garden and Port Ogden (D. E. Read), Bradenton (G. D. Reynolds), and Archbold Biological Station 10 miles south of Lake Placid (T. C. Schneirla).
